Carbonyl Iron Powder
Since our very beginnings over 140 years ago, innovation are key to our success. During this time, we, as the world’s leading chemical company, gained our reputation as a trustworthy partner to the industry.

We help our customers to be more successful – with a variety of products, services and intelligent system solutions. As a strategic partner, we support our customers in discovering business opportunities and in developing products, procedures and services.

The key to success is innovation, combined with quality and tradition.

BASF – the inventor of Carbonyl Iron Powder

BASF is the inventor and the leading producer of Carbonyl Iron Powder (CIP) worldwide. Since more than 80 years, BASF develops the most varied areas of applications for CIP. The result: A broad spectrum of CIP grades including tailor-made special grades. A product portfolio of high and consistent quality CIP, managed by our global sales network, offering our customers personal contact, direct support and fast response.

The carbonyl decomposition process for the production of Carbonyl Iron Powder was invented at BASF in 1925. CIP is produced at the world-scale production site in Ludwigshafen, Germany.
Its specific catalytic activity is the key to the synthesis of high-quality industrial diamonds. Its outstanding magnetic behavior is relevant for applications such as Inductive Electronic Components, Magnetorheological Fluids.

**PROPERTIES & APPLICATIONS**

The unique properties of Carbonyl Iron Powder (CIP) made by BASF open up a wide range of existing and future applications:

- **Its exceptional fineness and spherical morphology** leads to excellent compaction and sintering properties. These properties are exploited in Diamond Tool Production, Metal Injection Molding, and conventional Powder Metallurgy.

- **Its unique microstructure** makes CIP an excellent absorber of microwave frequencies, enabling technologies from EMI shielding to radar absorption. Its unparalleled purity and consistent high quality are the main reasons why many customers choose BASF’s CIP.

CIP is produced by thermal decomposition of iron pentacarbonyl (Fe(CO)₅), which is previously distilled to high purity. In the course of the decomposition process, spherical iron layers form on a nucleus, thereby developing a shell structure. The decomposition conditions determine the main properties, including the particle size distribution of the intermediate products. The individual CIP grades are gained from these by a number of finishing processes like milling (deagglomeration of secondary particles), classifying (tailing of particle size distribution), mixing, and coating.

**THE PROCESS – FROM IRON TO CIP**

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Our extensive expertise in the production of CIP allows us to accurately control the properties of our powders. In addition to our broad standard portfolio, we are able to develop CIP grades with properties, which exactly correspond to the precise requirements of the individual application. Generally, two product CIP groups can be distinguished: unreduced or “hard” grades and reduced or “soft” grades.

Hard grades
These grades are produced from the primary decomposition products without further chemical processing.
- Onion skin structure
- Mechanically hard
- Fe content up to 97.8 %
- Other elements (typically): C max. 1.0 %, N max. 0.9 %, O max. 0.5 %

Soft grades
These grades are produced by annealing of hard grades under hydrogen. In this process, the onion skin structure is lost, and the content of N, C, and O is reduced.
- Polycrystalline structure
- Mechanically soft
- Excellent compaction properties
- Fe content up to 99.8 %
- Low C, N, and O content

Hard and soft grades are available with different particle size distributions:

CIP by BASF offers you:
- Mean particle size < 10 microns
- Unparalleled chemical purity
- Excellent lot-to-lot consistency
- More than 80 years of experience in CIP production

BASF offers you:
- Reliability and sustainability offered by the world’s leading chemical company
- Worldwide network of sales representatives
- Global R&D team with outstanding competencies in chemistry and processes
Please contact us to discuss the requirements of your CIP application.

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**Note**  
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Carbonyl Iron Powder
### Overview CIP product range

<table>
<thead>
<tr>
<th>Grade</th>
<th>application</th>
<th>type</th>
<th>Fe min. (%)</th>
<th>C max. (%)</th>
<th>N max. (%)</th>
<th>O max. (%)</th>
<th>d50 value (microns)</th>
<th>coating</th>
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<tbody>
<tr>
<td>CIP EM</td>
<td>Electronic Components</td>
<td>hard</td>
<td>97.0</td>
<td>0.65–0.85</td>
<td>0.6–0.8</td>
<td>0.1–0.3</td>
<td>4.5–6</td>
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<tr>
<td>CIP SQ</td>
<td>Electronic Components</td>
<td>soft</td>
<td>99.5</td>
<td>0.05</td>
<td></td>
<td>0.22</td>
<td>3.9–5.0</td>
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<td>CIP SQ-I</td>
<td>Electronic Components</td>
<td>soft</td>
<td>98.5</td>
<td>0.03</td>
<td></td>
<td>0.7</td>
<td>3.8–5.4 yes</td>
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<td>CIP SW-S</td>
<td>Electronic Components</td>
<td>soft</td>
<td>0.4</td>
<td></td>
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<td>3.0–4.5 yes</td>
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<td>CIP SP-I</td>
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<td>99.5</td>
<td>0.05</td>
<td></td>
<td></td>
<td>6–10 yes</td>
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<tr>
<td>CIP EW</td>
<td>Electronic Components &amp; Microwave Absorption</td>
<td>hard</td>
<td>97.0</td>
<td>0.9</td>
<td>0.9</td>
<td></td>
<td>3.0–4.0</td>
<td>yes</td>
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<tr>
<td>CIP ER</td>
<td>Microwave Absorption</td>
<td>hard</td>
<td>97.0</td>
<td>1.0</td>
<td>1.0</td>
<td>0.8</td>
<td>4.5</td>
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<tr>
<td>CIP ES</td>
<td>Microwave Absorption</td>
<td>hard</td>
<td>97.4</td>
<td>1.1</td>
<td>1.2</td>
<td>0.6</td>
<td>3.4–4.5</td>
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<tr>
<td>CIP EW-I</td>
<td>Microwave Absorption</td>
<td>hard</td>
<td>97.0</td>
<td>0.9</td>
<td></td>
<td></td>
<td>3.0–4.0 yes</td>
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<td>CIP OM</td>
<td>Metal Injection Molding</td>
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<td>97.8</td>
<td>0.75–0.90</td>
<td>0.65–0.90</td>
<td>0.15–0.40</td>
<td>3.9–5.2</td>
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<tr>
<td>CIP OS</td>
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<td>97.5</td>
<td>0.7–0.9</td>
<td>0.5–0.9</td>
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<td>3.4–4.4</td>
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<td>CIP CC</td>
<td>Metal Injection Molding &amp; powder Metallurgy</td>
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<td>99.5</td>
<td>0.05</td>
<td>0.01</td>
<td>0.18–0.35</td>
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<td>CIP CM</td>
<td>Powder Metallurgy</td>
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<td>99.5</td>
<td>0.03</td>
<td>0.01</td>
<td>0.1–0.25</td>
<td>7.0–9.5</td>
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<td>Powder Metallurgy</td>
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<td>99.5</td>
<td>0.03</td>
<td>0.01</td>
<td>0.12–0.30</td>
<td>6.0–7.0</td>
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<td>CIP CN</td>
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<td>99.5</td>
<td>0.03</td>
<td>0.01</td>
<td>0.10–0.25</td>
<td>6.5–8.0</td>
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<td>CIP SM</td>
<td>Diamond Tools</td>
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<td>0.55</td>
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<td>1.0</td>
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<td>1.3</td>
<td>0.3</td>
<td>1.4</td>
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<tr>
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<td>Nutritional Supplement</td>
<td>soft</td>
<td>99.5</td>
<td>0.03</td>
<td>0.01</td>
<td>0.23</td>
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<td>ZVI MICROSPHERES 200</td>
<td>Groundwater Remediation</td>
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<td>97.5</td>
<td>1.0</td>
<td>1.0</td>
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<td>CIP FM</td>
<td>Other</td>
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<td>1.0</td>
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<td>Other</td>
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<td>0.9</td>
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<td>Other</td>
<td>hard</td>
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<td>0.6–0.9</td>
<td>0.6–0.9</td>
<td>0.3–0.5</td>
<td>2.0</td>
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<td>CIP HS</td>
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<td>hard</td>
<td>97.5</td>
<td>1.0</td>
<td>1.0</td>
<td>0.5</td>
<td>1.8–2.3</td>
<td></td>
</tr>
</tbody>
</table>

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